

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
18 September 2003 (18.09.2003)

PCT

(10) International Publication Number
WO 03/077112 A1

(51) International Patent Classification⁷: **G06F 3/14**

(21) International Application Number: **PCT/US02/15385**

(22) International Filing Date: **15 May 2002 (15.05.2002)**

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:
60/360,068 25 February 2002 (25.02.2002) US

(71) Applicant (for all designated States except US): **PREDICTIVE NETWORKS, INC.** [US/US]; 689 Massachusetts Avenue, Cambridge, MA 02139 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **THURSTON,**

Nathaniel [US/US]; 40 Cedar Street No. 2 Right, Somerville, MA 02143 (US). **HOSEA, Devin** [US/US]; 3 Gloucester Street No. 10, Boston, MA 02115 (US).

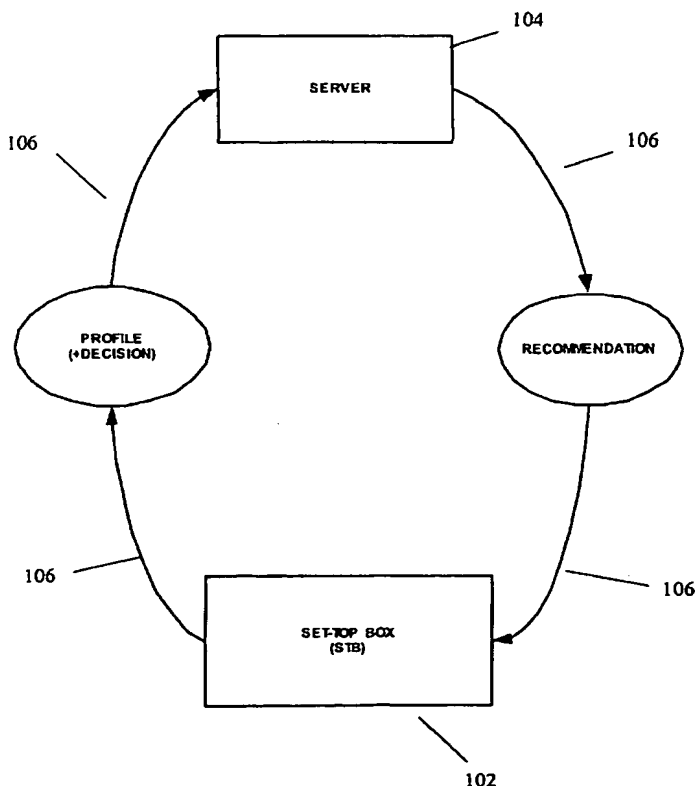
(74) Agent: **JACOBS, David**; Lucash, Gesmer & Updegrave, LLP, 40 Broad Street, Boston, MA 02109 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR,

[Continued on next page]

(54) Title: **PRIVACY-MAINTAINING METHODS AND SYSTEMS FOR COLLECTING INFORMATION**



(57) Abstract: A method and system for collecting and aggregating information (Fig. 1) from user terminals, such as set-top boxes (STBs) that may employ electronic programming guide (EPG) features, without the necessity of collecting or storing personal, private user information. The invention also enables collaborative filtering and the generation of recommended future decisions based on anonymous user profile information.

WO 03/077112 A1

BEST AVAILABLE COPY



GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,
NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— *with international search report*

PRIVACY-MAINTAINING METHODS AND SYSTEMS FOR COLLECTING INFORMATION

5

PRIORITY CLAIM

The present application claims priority to co-pending Provisional
Application Patent Application serial no. 60/360,068 entitled "Privacy-
Maintaining Methods and Systems for Collecting Information", filed on
10 February 25, 2002, and having a common inventive entity.

INCORPORATION BY REFERENCE

The present application for United States Patent incorporates by
reference the following commonly-owned patent applications, as if set
15 forth in their entirety herein, for all purposes:

WO 0120481A2 {Predictive Networks PCT application};
PCT Application No. PCT/US02/_____ entitled "Compact
Implementations For Limited-Resource Platforms" filed May 15, 2002;
20 U.S. Patent Application No. 60/338,398 filed December 7, 2001;
U.S. Patent Application entitled: "Television Program Navigation
Guide" filed December 5, 2001;
U.S. Patent Application entitled: "Method and System for Selective
Initial Television Channel Display" filed October 22, 2001;
25 U.S. Patent Application No. 09/969,911 filed October 3, 2001;
U.S. Patent Application entitled: "Method and System for Parsing
Purchase Information from Web Pages filed August 29, 2001;
U.S. Patent Application No. 09/928,493 filed August 13, 2001;
U.S. Patent Application No. 09/877,974 filed June 7, 2001;
30 U.S. Patent Application No. 09/558,755 filed April 21, 2001;
U.S. Patent Application No. 60/282,028 filed April 6, 2001;
U.S. Patent Application No. 09/798,337 filed March 2, 2001;
U.S. Patent Application No. 09/777,807 filed February 5, 2001;
U.S. Patent Application No. 09/767,693 filed January 23, 2001; and
35 U.S. Patent Application No. 09/766,377 filed January 19, 2001.

BACKGROUND OF THE INVENTION

Collaborative filtering is a method that enables individuals to benefit from the aggregated knowledge, experience, and decision-making history of similarly-situated individuals. In general, collaborative filtering operates by using the decisions a first individual makes to locate a group of other individuals who made similar decisions, and then using the aggregate decisions made by the group to suggest possible future (or alternative) actions by the first individual.

A well-known example of collaborative filtering is the "Others Who Bought This Book Also Liked . . ." recommendations from various online booksellers such as Amazon.com.

However, in order for conventional collaborative filtering systems to operate, a detailed log of individual decision-making must be collected and stored by the operator of the system (or a proxy thereof). These logs often contain personal, private information of individuals, and as a result, many individuals are reluctant to permit this information to be collected. Moreover, legal restrictions may apply to the collection, storage, and subsequent use of such information. As a result, the gathering and storage of such logs is problematic.

These problems extend to the EPG/IPG environment, examples of which are set forth in the following U.S. and foreign patent documents, among others, the disclosures of which are incorporated herein by reference as if set forth in their entirety here:

25 U.S. Pat. 6,177,931
 U.S. Pat. 6,163,316
 U.S. Pat. 6,005,597

Alexander et al.
Killian
Barrett et al.

WO 0049801A1
WO 0033224A1

Yuen et al.
Yuen

In the EPG environment, for example, it would be useful to provide
5 collaborative filtering-based recommendations ("People Who Selected
This Content Also Selected . . .") without raising the hackles of privacy
interests or running afoul of legal restrictions. In addition, there are other
legitimate and useful reasons to collect information from viewers (for
example, to provide information about viewership, ratings, and other
10 audience characteristics), but in the past, such efforts have conflicted with
the important interests of privacy.

What is desired, but non-existent, are methods and systems that
enable the collection of information for collaborative filtering and other
legitimate purposes, but that avoid the transmission or storage of private,
15 identifiable, personal information.

It is also desirable to be able to generate multi-dimensional user
profiles without the necessity of collecting or storing personal information.

SUMMARY OF THE INVENTION

20 The present invention provides methods and systems for collecting
and aggregating information from user terminals, such as set-top boxes
(STBs) that may employ electronic programming guide (EPG) features,
without the necessity of collecting or storing personal, private user
information. The invention also enables collaborative filtering and the
25 generation of recommended future decisions based on anonymous user
profile information.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

Features and advantages of the present invention will become apparent to those skilled in the art from the description below, with
5 reference to the following drawing figures, in which:

FIG. 1 is a block diagram illustrating an STB/server environment in which the present invention can be implemented.

FIG. 2 is a flowchart illustrating method steps of one practice of the invention.

10

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

Prior Art Systems: The structure and operation of conventional networked systems, such as those using a server and subscriber terminals (including set-top boxes (STBs), EPG/IPGs, monitors, pointing devices
15 and other control devices), are well-known in the art. Examples are set forth in the U.S. and foreign patent documents listed above, the teachings of which are incorporated herein by reference as if set forth herein in their entirety.

Present Invention: FIG. 1 is a block diagram showing an example of
20 an environment in which the system and methods of the present invention may be deployed. As shown in FIG. 1, consumer terminal 102 (in this case, a set-top box (STB)) is in communication with server 104 via communications link 106. The STB, server, and communications link can be substantially conventional in design and construction, like those shown
25 in a number of the above-listed references listed above.

It should be noted that the present invention is not limited to use with STBs and television systems, but can be used in conjunction with any manner of content- or information-distribution systems, including those utilizing the Internet, cable television systems, satellite television
5 distribution systems, and the like.

FIG. 2 is a flowchart illustrating the steps of a method according to the invention, which may be deployed in the architecture of FIG. 1.

In the illustrated embodiments of the invention, each consumer terminal 202 (in the illustrated embodiments, a set-top box (STB) or the
10 like), constructs and maintains a digital profile summarizing interests and decisions made on that terminal.

Alternatively, the STB may store separate profiles for each individual who uses the STB.

These profiles may be generated using known methods described in
15 the prior art, such as the Yuen WIPO publications listed above, which are incorporated herein by reference in their entirety, as if set forth completely herein.

Whenever a user decision is made, the STB transmits the profile, together with the decision, to a central server in a step 204. The
20 transmitted information contains no information that is personally identifiable. The profile (and if sent, the latest decision information) becomes an anonymous proxy for the user.

Upon receiving this information, the server can average the profile with several (or many) similar profiles in step 206, thereby to erase or
25 "blur" any remaining traces or suggestions of personal information, and to

make it substantially impossible to track the source of any decision, even if the content of the STB is later exposed.

In step 208 the (possibly modified) silhouette, together with the decision made, can be stored in a central database.

5 Next, a program running on the server can process the decisions collected from the participating STBs, and based on the processing, generate recommendations of decisions for various profiles in a step 210. For example, the server might generate a recommendation for Super Bowl programming for users whose profiles indicate high interest in National
10 Football League sports programming.

In step 212, these recommended decisions are then broadcast back to the consumer terminals/STBs.

A program operating on the STB can then compare the profiles of the transmitted recommendations with the profile current in use, and use
15 those which have similar profiles in a step 214.

Those skilled in the art will appreciate that many variations of the described embodiments may be utilized. For example, instead of a single decision, a multiple-decision action set or a summary of the most recent N actions could be transmitted.

20 Alternatively, the invention could be practiced without the most recent action set or decisions.

In addition, if personal information is inadvertently transmitted by the STB, it could be stripped off electronically using known techniques and discarded prior to storage and processing of the profile information.

25 The information that can be collected using the present invention can be used for collaborative filtering, and can also be used in numerous

other ways, including generating ratings or other viewership information. The information can also be used to generate multi-dimensional viewer profiles, without the necessity of collecting or storing private, personal information.

5

Having described the illustrated embodiments of the present invention, it will be apparent that modifications can be made without departing from the spirit and scope of the invention, as defined by the appended claims.

CLAIMS

1. In a networked system including at least a server and a user terminal device, a privacy-maintaining method of collecting information,
5 the method comprising:
generating, at the user terminal, a profile corresponding to at least a first user,
when a user action is taken on the user terminal, capturing the user action;
10 transmitting to the server the profile and an action set representative of at least one captured user action, and
receiving the profile and action set at the server
2. The method of claim 1 further comprising:
15 processing the profile and action set to generate a recommendation of a future decision suitable for the profile.
3. The method of claim 2 further comprising:
transmitting to the STB the recommendation of a future decision
20 suitable for the profile.
4. The method of claim 1 wherein neither the profile nor the action set contain personal information of the first user.
- 25 5. The method of claim 1 further comprising generating multiple profiles, each corresponding to a different, respective user.

6. The method of claim 1 wherein the action set comprises a summary of recent user actions.

5 7. The method of claim 1 wherein the action set comprises at least one user decision taken on the user terminal.

8. The method of claim 1 wherein the action set is an empty set, such that the user terminal transmits only the profile.

10

9. The method as in any of claims 1-8 wherein:
the server:

receives, from multiple user terminals, a plurality of profiles
and action sets,

15 processes the plurality of profiles and action sets to generate
recommendations of future decisions corresponding to respective
profiles, and

broadcasts the recommendations to the plurality of STBs,
and the STB:

20 compares the profiles of the recommendations with the profile
currently in use,

and selects from the recommendations those
recommendations having profiles similar to the profile currently in
use.

25

10. In a networked system including at least a server and a user terminal device, a privacy-maintaining system for collecting information, the system comprising:

means for generating, at the user terminal, a profile corresponding to

5 at least a first user,

means for transmitting to the server, when a current user action is taken on the user terminal, the profile and an action set representative of at least the current user action, and

means for receiving the profile and action set at the server.

10

11. The system of claim 10 further comprising:

means for processing the profile and action set to generate a recommendation of a future decision suitable for the profile.

15

12. The system of claim 11 further comprising:

means for transmitting to the STB the recommendation of a future decision suitable for the profile.

20

13. The system of claim 10 wherein neither the profile nor the action set contain personal information of the first user.

14. The system of claim 10 further comprising:

means for generating multiple profiles, each corresponding to a different, respective user.

25

15. The system of claim 10 wherein the action set comprises a summary of recent user actions.

16. The system of claim 10 wherein the action set comprises at least
5 one user decision taken on the user terminal.

17. The system of claim 10 wherein the action set is an empty set, such that the user terminal transmits only the profile.

10 18. The system as in any of claims 10-17 wherein:
the server:

receives, from multiple user terminals, a plurality of profiles
and action sets,

15 processes the plurality of profiles and action sets to generate
recommendations of future decisions corresponding to respective
profiles, and

broadcasts the recommendations to the plurality of STBs,
and the STB:

20 compares the profiles of the recommendations with the profile
currently in use, and

selects from the recommendations those recommendations
having profiles similar to the profile currently in use.

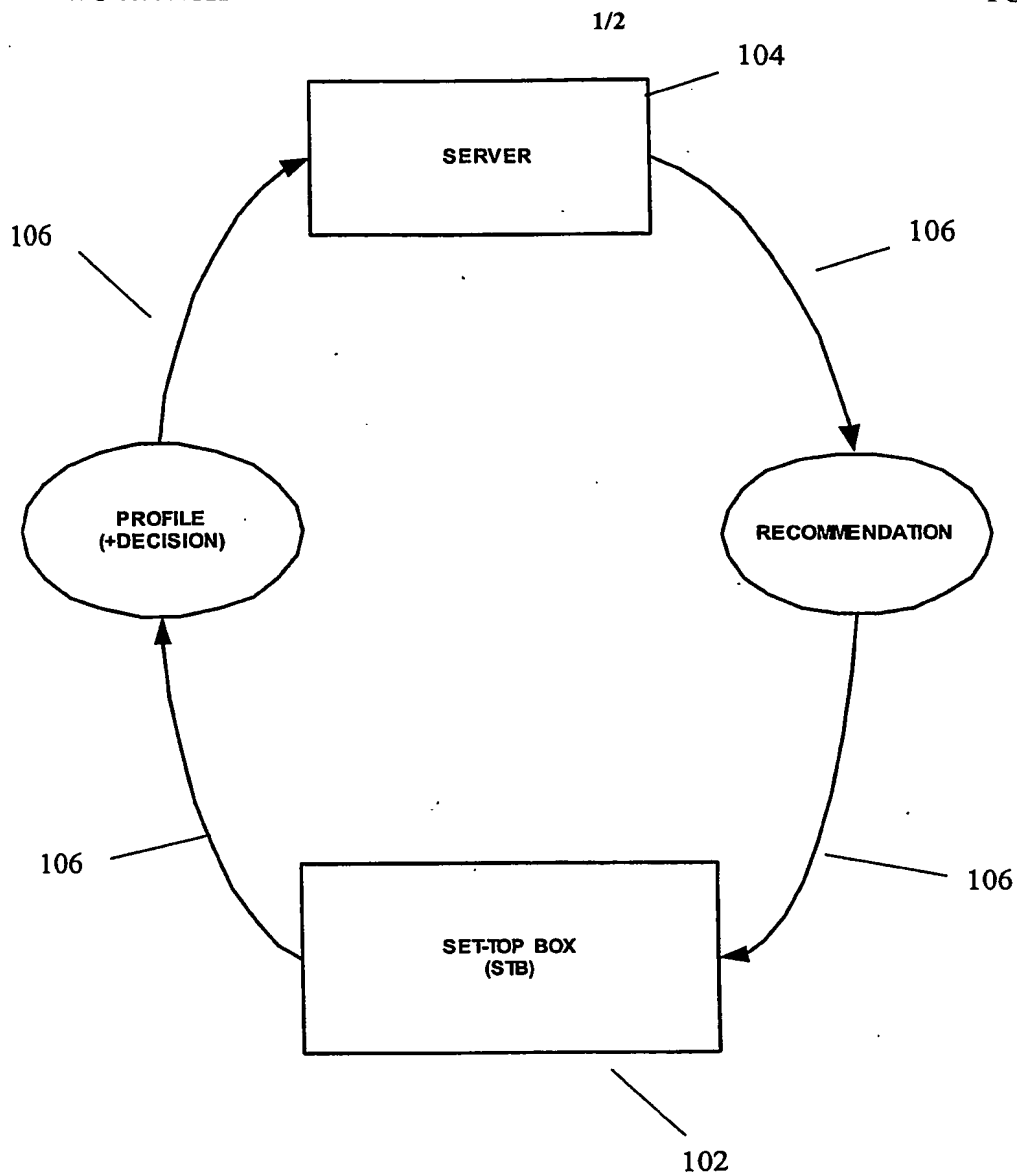


FIGURE 1

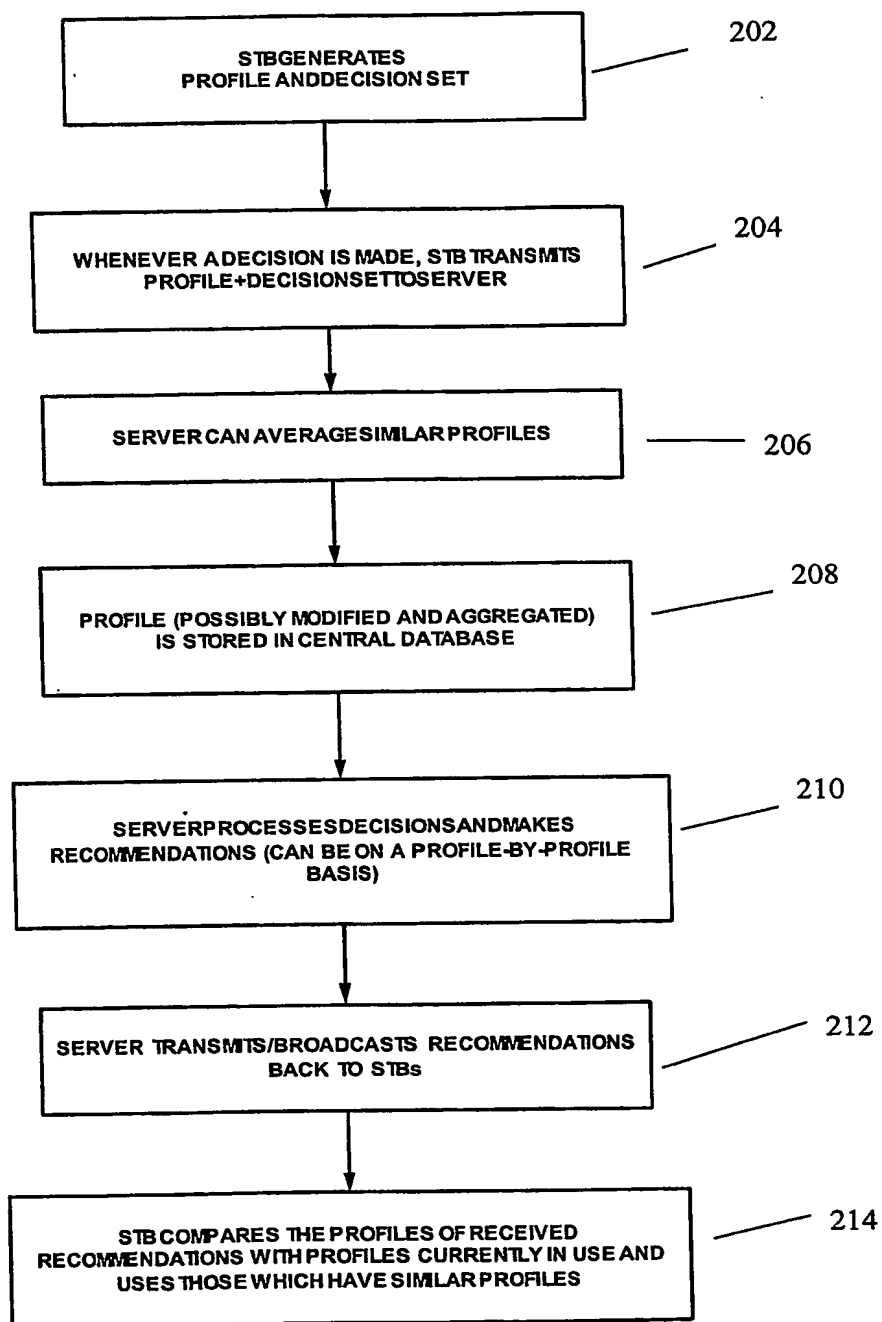


FIGURE 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/15385

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 3/14

US CL : 725/9, 10, 13, 46, 131, 139

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 725/9, 10, 13, 46, 131, 139

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Continuation Sheet**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,326,982 B1 (WU et al.) 04 December 2001 (04.12.2001), column 6, line 66 to col. 8, line 9.	1-18.
Y	US 6,219,355 B1 (BRODIGAN) 17 April 2001 (17.04.2001), column 1, line 50 to column 3, line 3.	1-18.
Y	US 6,049,831 A (GARDELL et al.) 11 April 2000 (11.04.2000), column 3, line 35 to column 6, line 15.	1-18.
Y	US 6,163,316 A (KILLIAN) 19 December 2000 (19.12.2000), column 1, line 65 to column 2, line 48.	1-18.
Y	US 6,137,539 A (LOWNES et al.) 24 October 2000 (24.10.2000), column 2, line 45 to column 4, line 45.	1-18.



Further documents are listed in the continuation of Box C.



See patent family annex.

Special categories of cited documents:	
* "A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"B" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

15 August 2002 (15.08.2002)

Date of mailing of the international search report

03 OCT 2002

Name and mailing address of the ISA/US

Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703)305-3230

Authorized officer

ANDREW FAILE

Telephone No. 703-305-4380

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

PCT/US02/15385

Continuation of B. FIELDS SEARCHED Item 3:

EAST.

Search terms: set top box, STB, program guide, EPG, multi user, multiple profile, general profile, generic profile, specific profile, collaborative filtering, and anonymous profile.

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.